

L Number	Hits	Search Text	DB	Time stamp
-	147	domain adj name with register\$4	USPAT; EPO; JPO; IBM_TDB	2003/05/30 12:22
-	147	domain adj name with register\$5	USPAT; EPO; JPO; IBM_TDB	2003/05/29 12:05
-	0	domain adj name with register\$5 and registry adj data\$base	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:13
-	5	domain adj name with register\$5 and regist\$4 adj data\$base	USPAT; EPO; JPO; IBM_TDB	2003/05/29 12:05
-	7	domain adj name with register\$5 and regist\$7 adj data\$base	USPAT; EPO; JPO; IBM_TDB	2003/05/29 12:06
-	7	domain adj name with register\$5 and regist\$7 adj data\$base and availabl\$4	USPAT; EPO; JPO; IBM_TDB	2003/05/29 12:06
-	11	("6012067" "5488725" "5404506" "6094647" "6055538" "6029195" "6006225" "5758149" "5852657" "5864845" "5943666").pn.	USPAT; EPO; JPO; IBM_TDB	2003/05/30 12:23
-	0	domain adj name with register\$5 and registry adj data\$base	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:13
-	10	domain adj name with register\$5 and registr\$4 with (data\$base data\$store)	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:18
-	1	domain adj name with register\$5 and registr\$4 with (data\$base data\$store) and check\$4 with box	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:14
-	1	domain adj name with register\$5 and registr\$4 with (data\$base data\$store) and check\$4 adj box	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:14
-	2	domain adj name with register\$5 and registr\$4 with (data\$base data\$store) and check\$box	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:15
-	7	domain adj name with register\$5 and registr\$4 with (data\$base data\$store) and available with name	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:29
-	31	domain adj name with register\$5 and (domain registr\$4) with (data\$base data\$store) and available with name	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:29
-	33	domain adj name with register\$5 and (domain regist\$4) with (data\$base data\$store) and available with name	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:47
-	21	domain adj name with register\$5 and regist\$7 with (data\$base data\$store) and available with name	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:30
-	33	domain adj name with register\$5 and (domain regist\$7) with (data\$base data\$store) and available with name	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:30
-	2	domain adj name with register\$5 and regist\$7 with (data\$base data\$store) and available with name and check\$4 adj box	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:30
-	2	domain adj name with register\$5 and regist\$7 with (data\$base data\$store) and available with name and check\$4 with box	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:30
-	7	domain adj name with register\$5 and (domain regist\$7) with (data\$base data\$store) and available with name and check\$4 with box	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:36
-	4	domain adj name with register\$5 and (domain regist\$7) with (data\$base data\$store) and available with name and check\$4 with box and expir\$6 with date	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:36
-	4	domain adj name with register\$5 and (domain regist\$7) with (data\$base data\$store) and available with name and check\$4 with box and expir\$6	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:37

-	36	domain adj name with register\$5 and (domain regist\$4) with (data\$base data\$store) and available with (domain name)	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:47
-	0	domain adj name with register\$5 and (domain regist\$4) with (data\$base data\$store) and available with (domain name) and list with check\$4 with box	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:48
-	0	domain adj name with register\$5 and (domain regist\$4) with (data\$base data\$store) and available with (domain name) and list\$4 with check\$4 with box	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:48
-	0	domain adj name with register\$5 and (domain regist\$4) with (data\$base data\$store) and available with (domain name) and (table list\$4) with check\$4 with box	USPAT; EPO; JPO; IBM_TDB	2004/02/17 13:48
-	7	domain adj name with register\$5 and (domain regist\$4) with (data\$base data\$store) and available with (domain name) and (table list\$4) and check\$4 with box	USPAT; EPO; JPO; IBM_TDB	2004/02/18 09:31
-	0	domain adj name with register\$5 and (domain regist\$4) with (data\$base data\$store) and available with (domain name) and (table list\$4) and check\$4 with box and register with (multiple plural)	USPAT; EPO; JPO; IBM_TDB	2004/02/18 09:31
-	0	domain adj name with register\$5 and (domain regist\$4) with (data\$base data\$store) and available with (domain name) and (table list\$4) and check\$4 with box and register with (multiple plural\$4)	USPAT; EPO; JPO; IBM_TDB	2004/02/18 09:31
-	0	domain adj name with register\$5 and (domain regist\$4) with (data\$base data\$store) and available with (domain name) and (table list\$4) and check\$4 with box and register same (multiple plural\$4)	USPAT; EPO; JPO; IBM_TDB	2004/02/18 09:31
-	7	domain adj name with register\$5 and (domain regist\$4) with (data\$base data\$store) and available with (domain name) and (table list\$4) and check\$4 with box and register\$4 same (multiple plural\$4)	USPAT; EPO; JPO; IBM_TDB	2004/02/18 09:32
-	2	domain adj name with register\$5 and (domain regist\$4) with (data\$base data\$store) and available with (domain name) and (table list\$4) and check\$4 with box and register\$4 with (multiple plural\$4)	USPAT; EPO; JPO; IBM_TDB	2004/02/18 09:34
-	44	Regist\$7 with (multiple plural\$4 group set) with domain adj name	USPAT; EPO; JPO; IBM_TDB	2004/02/18 09:35
-	3	Regist\$7 with (multiple plural\$4 group set) with domain adj name and single with request	USPAT; EPO; JPO; IBM_TDB	2004/02/18 09:36
-	2	Regist\$7 with (multiple plural\$4 group set) with (domain adj name) with (one single) with request	USPAT; EPO; JPO; IBM_TDB	2004/02/18 09:38
-	0	Regist\$7 with (multiple plural\$4 group set) with (domain adj name) with single with request	USPAT; EPO; JPO; IBM_TDB	2004/02/18 09:38
-	12	register with (plural\$4 multiple various group "more than one") with domain adj name	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 10:58
-	1	domain adj name and column with tld	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:02

-	1	domain adj name and column with (top adj level adj domain (tld))	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:03
-	30	domain adj name and column with (top adj level adj domain (tld) extension)	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:06
-	0	domain adj name and column with (top adj level adj domain (tld) extension) and (".net" ".com")	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:06
-	0	domain adj name and column with (top adj level adj domain (tld) extension) and (".net" ".com" ".org")	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:06
-	0	domain adj name and column with (top adj level adj domain (tld) extension) and (".net" ".com" ".org" ".gov")	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:18
-	11	domain adj name and column with (top adj level adj domain (tld) extension) and (net com)	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:07
-	1	domain adj name and column with (top adj level adj domain (tld) extension) with (net com)	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:09
-	0	row with (domain adj name) and column with (top adj level adj domain (tld) extension)	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:10
-	10	(row list\$4) with (domain adj name) and column with (top adj level adj domain (tld) extension)	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:10
-	0	domain adj name and column with (".net" ".com" ".org" ".gov")	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:19
-	511	domain adj name and table and row and column	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:19
-	0	domain adj name and table and row and column with tld	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:19
-	0	domain adj name and table and row and column with (level adj domain (tld))	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:20
-	1	domain adj name and table and row and column with (level with domain (tld))	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:22
-	2	domain with name and table and row and column with (level with domain (tld))	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:23
-	23	domain with name and table and row and column with (level with domain (tld) extension)	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:26
-	4708	column with (level adj domain (tld) extension)	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:59

-	104	row with (list name) and column with (level adj domain (tld) extension)	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:27
-	10	row with (list name) and column with (level adj domain (tld) extension) and domain adj name	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:31
-	487	register\$4 with (domain adj name)	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:31
-	83	register\$4 with (domain adj name) and (top adj level adj domain (tld))	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:32
-	12	register\$4 with (domain adj name) and (top adj level adj domain (tld)) and column	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 11:32
-	3	column with (level adj domain (tld))	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 12:02
-	38	column with domain adj name	USPAT; US-PGPUB; EPO; JPO; IBM_TDB	2004/02/18 12:02



US006560634B1

(12) **United States Patent**  
**Broadhurst**

(10) **Patent No.:** **US 6,560,634 B1**  
(45) **Date of Patent:** **May 6, 2003**

(54) **METHOD OF DETERMINING  
UNAVAILABILITY OF AN INTERNET  
DOMAIN NAME**

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(US)**

(73) **Assignee:** **VeriSign, Inc., Mountain View, CA  
(US)**

(\*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1 day.

(21) **Appl. No.:** **09/133,836**

(22) **Filed:** **Aug. 13, 1998**

#### Related U.S. Application Data

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(51) **Int. Cl.** **G06F 15/16**

(52) **U.S. Cl.** **709/203; 709/217; 709/219**

(58) **Field of Search** **709/217, 224,  
709/223, 219, 245, 227, 249, 203; 707/104,  
500, 505**

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\* cited by examiner

*Primary Examiner*—Glenton B. Burgess

*Assistant Examiner*—Tod Kupstas

(74) *Attorney, Agent, or Firm*—Kenyon & Kenyon

(57) **ABSTRACT**

Methods, systems, and articles of manufacture consistent with the present invention provide an improved query server that overcomes the shortcomings of existing domain name searching techniques by performing a multitude of searches simultaneously, transparent to the user. Specifically, the improved query server searches for existing domain name records in various domains and then displays the results in a formatted manner, thus eliminating the need for a user to perform individual searches.

**17 Claims, 9 Drawing Sheets**

idNames.com™

SEARCH FOR A NAME

TOP 50 COUNTRIES RANKED BY ANNUAL  
GROSS DOMESTIC PRODUCT

ENTER NAME:

ENTER YOUR NAME IN THE TEXT BOX (WITHOUT EXTENSIONS). FOR EXAMPLE, ENTER "yourname" NOT "www.yourname.com". CLICK ON THE "SEARCH" BUTTON TO SEARCH THE TOP 50 COUNTRIES RANKED BY ANNUAL GROSS DOMESTIC PRODUCT.

1. USA	18. IRAN	35. SWITZERLAND
2. JAPAN	19. TURKEY	36. AUSTRIA
3. CHINA	20. NETHERLANDS	37. HONG KONG
4. GERMANY	21. ARGENTINA	38. BANGLADESH
5. INDIA	22. TAIWAN	39. NIGERIA
6. UNITED KINGDOM	23. PAKISTAN	40. PORTUGAL
7. FRANCE	24. SOUTH AFRICA	41. DENMARK
8. ITALY	25. POLAND	42. CHILE
9. BRAZIL	26. UKRAINE	43. ALGERIA
10. MEXICO	27. BELGIUM	44. NORWAY
11. RUSSIA	28. VENEZUELA	45. GREECE
12. CANADA	29. SAUDI ARABIA	46. MOROCCO
13. INDONESIA	30. COLOMBIA	47. VIET NAM
14. SPAIN	31. MALAYSIA	48. FINLAND
15. SOUTH KOREA	32. SWEDEN	49. CZECH REPUBLIC
16. AUSTRALIA	33. PHILIPPINES	50. SYRIA
17. THAILAND	34. EGYPT	

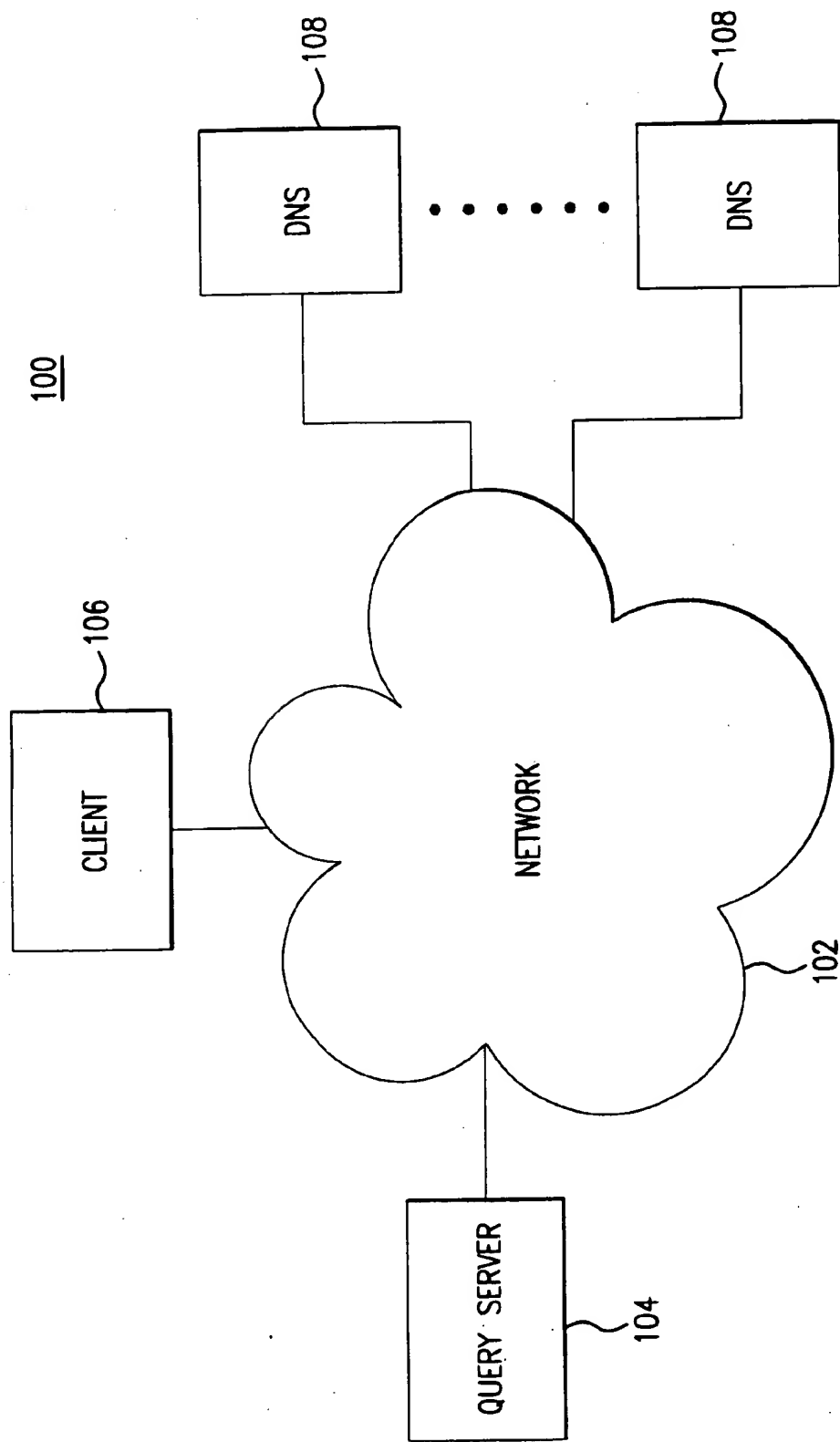


FIG.1

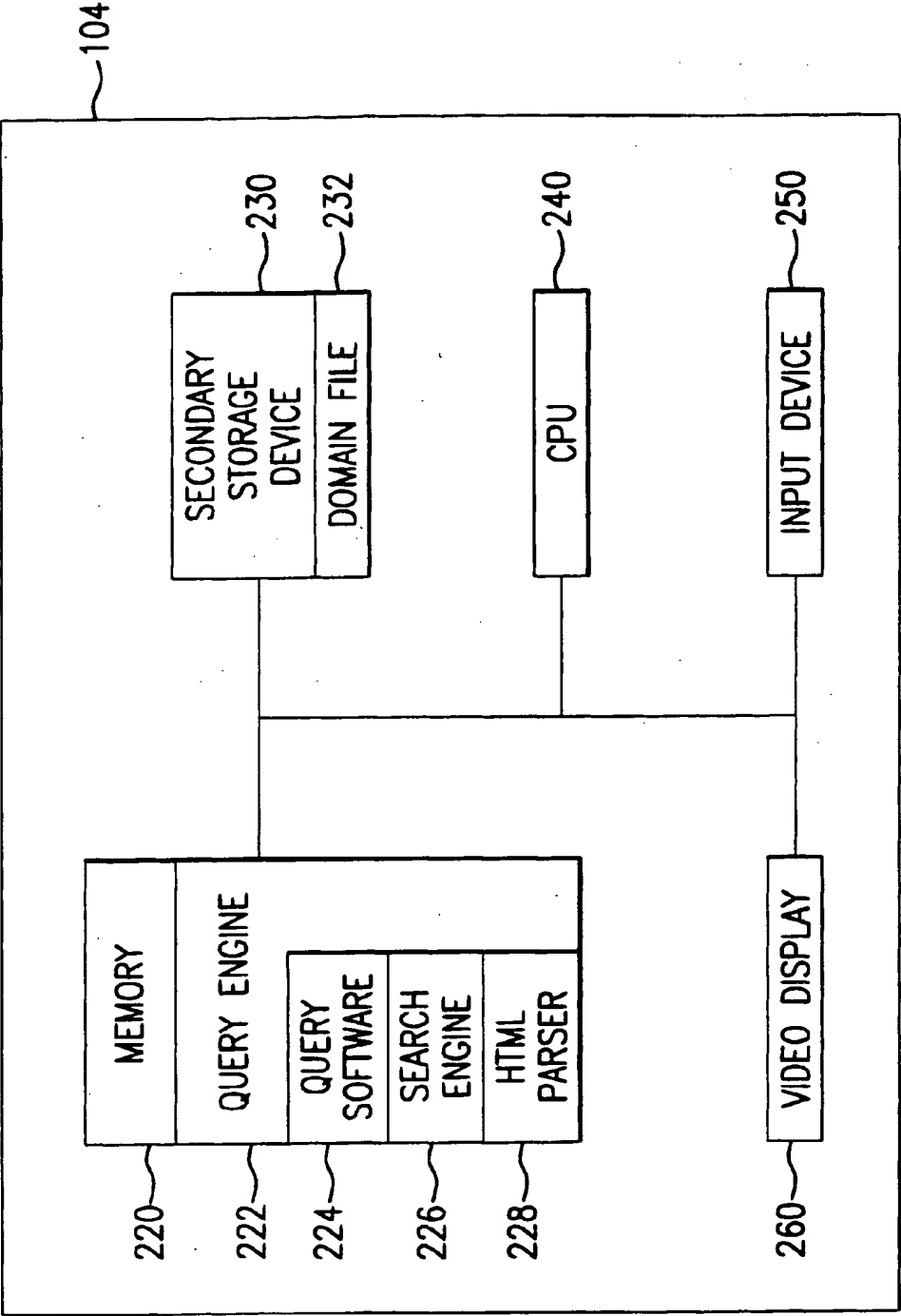


FIG.2

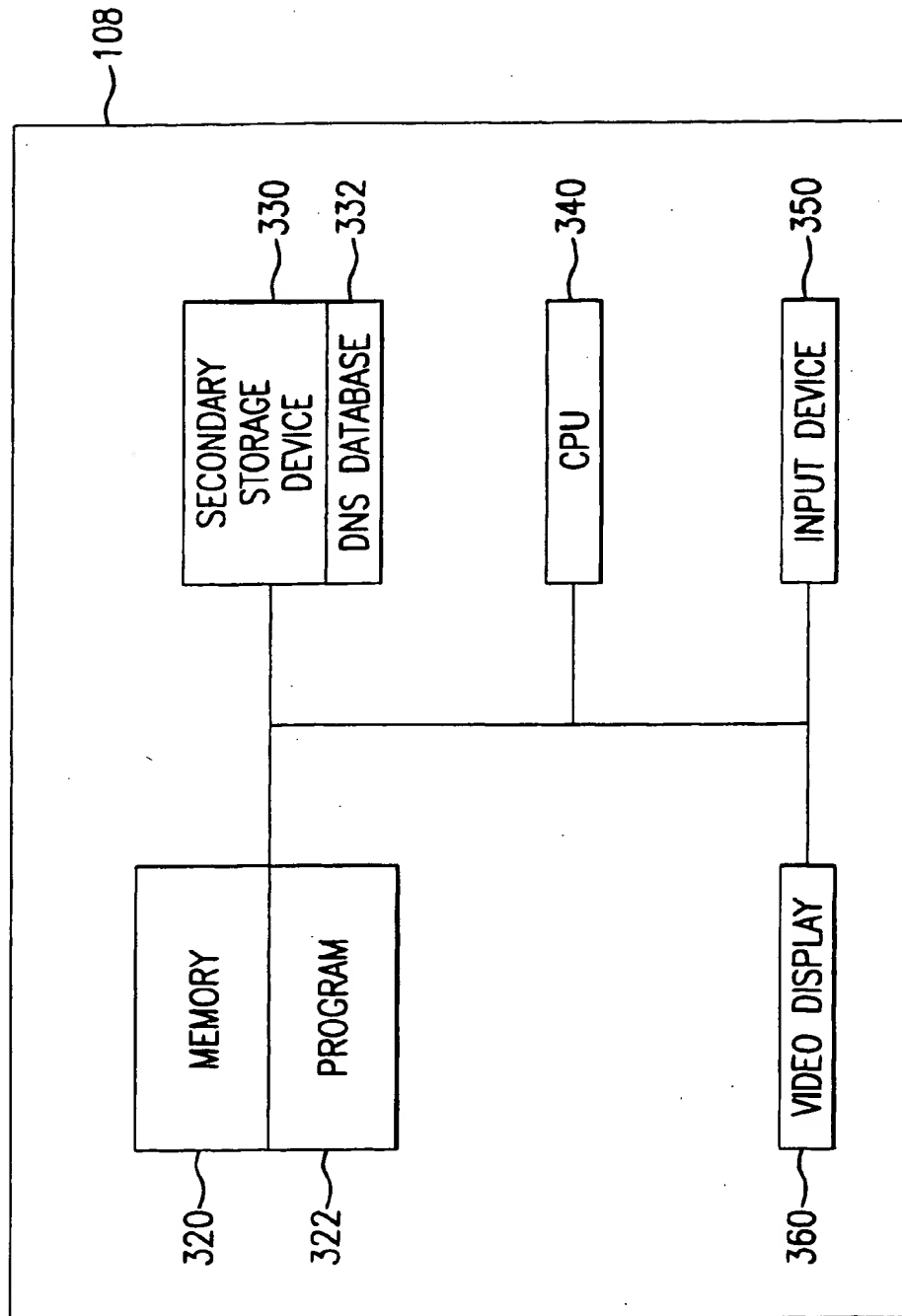


FIG. 3



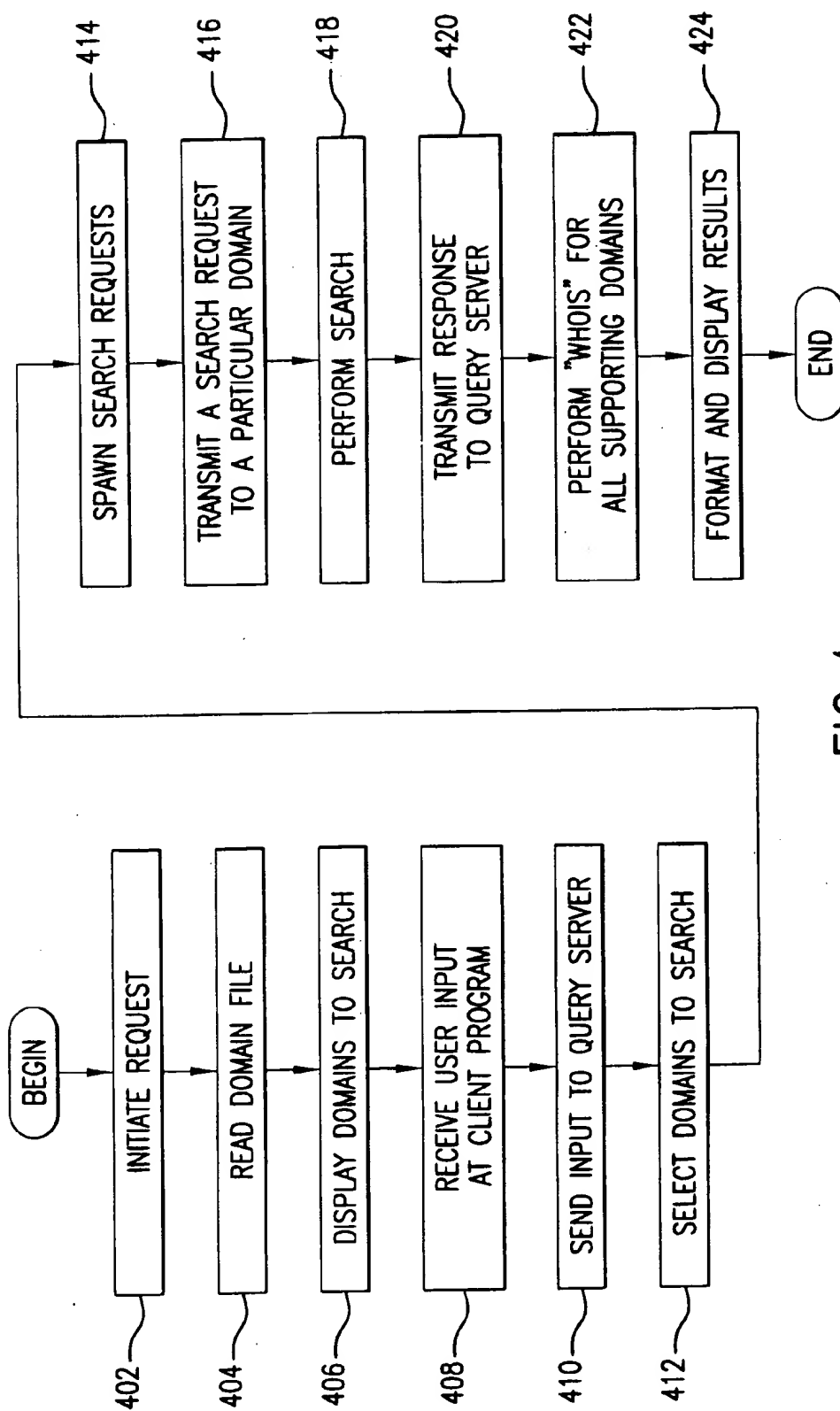


FIG. 4

idNames.com™

---

SEARCH FOR A NAME

SEARCH THE WORLD  
(OVER 400 DOMAINS AT ONCE)

---

ENTER NAME:

SEARCH

ENTER YOUR NAME IN THE TEXT BOX (WITHOUT EXTENSIONS). FOR  
EXAMPLE, ENTER "yourname" NOT "www.yourname.com". CLICK ON  
THE "SEARCH" BUTTON TO SEARCH OVER 400 DOMAINS, WORLDWIDE!

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FIG.5A

# idNames.com™

SEARCH FOR A NAME

## TOP 50 COUNTRIES RANKED BY ANNUAL GROSS DOMESTIC PRODUCT

ENTER NAME:

SEARCH

ENTER YOUR NAME IN THE TEXT BOX (WITHOUT EXTENSIONS). FOR  
EXAMPLE, ENTER "yourname" NOT "www.yourname.com". CLICK ON  
THE "SEARCH" BUTTON TO SEARCH THE TOP 50 COUNTRIES RANKED BY  
ANNUAL GROSS DOMESTIC PRODUCT.

- |                   |                  |                    |
|-------------------|------------------|--------------------|
| 1. USA            | 18. IRAN         | 35. SWITZERLAND    |
| 2. JAPAN          | 19. TURKEY       | 36. AUSTRIA        |
| 3. CHINA          | 20. NETHERLANDS  | 37. HONG KONG      |
| 4. GERMANY        | 21. ARGENTINA    | 38. BANGLADESH     |
| 5. INDIA          | 22. TAIWAN       | 39. NIGERIA        |
| 6. UNITED KINGDOM | 23. PAKISTAN     | 40. PORTUGAL       |
| 7. FRANCE         | 24. SOUTH AFRICA | 41. DENMARK        |
| 8. ITALY          | 25. POLAND       | 42. CHILE          |
| 9. BRAZIL         | 26. UKRAINE      | 43. ALGERIA        |
| 10. MEXICO        | 27. BELGIUM      | 44. NORWAY         |
| 11. RUSSIA        | 28. VENEZUELA    | 45. GREECE         |
| 12. CANADA        | 29. SAUDI ARABIA | 46. MOROCCO        |
| 13. INDONESIA     | 30. COLOMBIA     | 47. VIET NAM       |
| 14. SPAIN         | 31. MALAYSIA     | 48. FINLAND        |
| 15. SOUTH KOREA   | 32. SWEDEN       | 49. CZECH REPUBLIC |
| 16. AUSTRALIA     | 33. PHILIPPINES  | 50. SYRIA          |
| 17. THAILAND      | 34. EGYPT        |                    |

FIG.5B


608      SEARCH RESULTS: MERCEDES      602

NAME	RESULTS	DOMAIN DESCRIPTION	REGISTER
MERCEDES.com.au	REGISTERED	AUSTRALIA COMMERCIAL	
MERCEDES.co.nz	REGISTERED	NEW ZEALAND COMMERCIAL	
MERCEDES.com.sg	REGISTERED	SINGAPORE COMMERCIAL	
MERCEDES.net.au	AVAILABLE	AUSTRALIA NETWORKS	REGISTER NOW
MERCEDES.org.au	AVAILABLE	AUSTRALIA ORGANIZATIONS	REGISTER NOW
MERCEDES.com.cn	AVAILABLE	CHINA COMMERCIAL	REGISTER NOW
MERCEDES.net.cn	AVAILABLE	CHINA NETWORKS	REGISTER NOW
MERCEDES.org.cn	AVAILABLE	CHINA ORGANIZATIONS	REGISTER NOW
MERCEDES.com.hk	AVAILABLE	HONG KONG COMMERCIAL	REGISTER NOW
MERCEDES.net.hk	AVAILABLE	HONG KONG NETWORKS	REGISTER NOW
MERCEDES.org.hk	AVAILABLE	HONG KONG ORGANIZATIONS	REGISTER NOW
MERCEDES.co.id	AVAILABLE	INDONESIA COMMERCIAL	REGISTER NOW
MERCEDES.net.id	AVAILABLE	INDONESIA NETWORKS	REGISTER NOW
MERCEDES.co.jp	AVAILABLE	JAPAN COMMERCIAL	REGISTER NOW
MERCEDES.com.my	AVAILABLE	MALAYSIA COMMERCIAL	REGISTER NOW
MERCEDES.net.my	AVAILABLE	MALAYSIA NETWORKS	REGISTER NOW
MERCEDES.org.my	AVAILABLE	MALAYSIA ORGANIZATIONS	REGISTER NOW
MERCEDES.net.nz	AVAILABLE	NEW ZEALAND NETWORKS	REGISTER NOW
MERCEDES.org.nz	AVAILABLE	NEW ZEALAND ORGANIZATIONS	REGISTER NOW
MERCEDES.ph	AVAILABLE	PHILIPPINES	REGISTER NOW
MERCEDES.co.kr	AVAILABLE	REPUBLIC OF KOREA COMMERCIAL	REGISTER NOW
MERCEDES.net.sg	AVAILABLE	SINGAPORE NETWORKS	REGISTER NOW
MERCEDES.org.sg	AVAILABLE	SINGAPORE ORGANIZATIONS	REGISTER NOW
MERCEDES.com.tw	AVAILABLE	TAIWAN COMMERCIAL	REGISTER NOW
MERCEDES.net.tw	AVAILABLE	TAIWAN NETWORKS	REGISTER NOW
MERCEDES.org.tw	AVAILABLE	TAIWAN ORGANIZATIONS	REGISTER NOW
MERCEDES.co.th	AVAILABLE	THAILAND COMMERCIAL	REGISTER NOW

604      606      610

FIG.6A

## WHOIS INFORMATION



WHOIS: MERCEDES.com.au (AUSTRALIA COMMERCIAL)

domain: mercedes.com.au  
descr: MERCEDES-BENZ (AUSTRALIA) PTY LTD  
descr: PO BOX 214 MULGRAVE VICTORIA 3170  
admin-c: AB1-AU  
zone-c: AB1-AU  
changed: hostmaster@aunic.net 960326  
source: AUNIC

person: ANDREW BIRCH  
address: MERCEDES-BENZ (AUSTRALIA) PTY LTD  
address: PO BOX 214  
address: GLEN WAVERLY  
address: VIC 3150  
address: AU  
phone: +61 3 566 9389  
fax-no: +61 3 566 9147  
email: mb-net-au@aunic.net  
nic-hdl: AB1-AU  
changed: hostmaster@aunic.net 940314  
source: AUNIC

FIG.6B

## COUNTRY BY COUNTRY ORDER FORM

NAME OF PERSON COMPLETING THIS FORM

NAME

EMAIL

PHONE

FAX (OPTIONAL)

DOMAIN NAME:

DOMAIN NAME

COUNTRY	COMMERCIAL SUB-DOMAIN IF REQUIRED	ccTLD	NSI SERVICE FEE	INITIAL REGISTRY FEE	REGISTRY MAINT. FEE	MULTIPLE NAMES ALLOWED	COMMENTS
<input type="checkbox"/> PHILIPPINES	COM	PH	249	40	0	YES	

## CREDIT CARD INFORMATION

NAME ON CARD

EXPIRATION DATE

ACCOUNT NUMBER

ZIP CODE\*

(\*THIS ONLY APPLIES TO CUSTOMERS WITHIN THE UNITED STATES. PLEASE ENTER THE ZIP CODE TO WHICH YOUR CREDIT CARD STATEMENT IS MAILED.)

☐ VISA☐ MASTERCARD☐ AMERICAN EXPRESS

FIG.6C

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# METHOD OF DETERMINING UNAVAILABILITY OF AN INTERNET DOMAIN NAME

## RELATED APPLICATIONS

Provisional U.S. Patent Application No. 60/055,787, entitled "Method of Determining Unavailability of an Internet Domain Name," filed on Aug. 15, 1997, is relied upon and is incorporated by reference in this application.

## BACKGROUND OF THE INVENTION

### A. Field of the Invention

This invention relates generally to data processing systems and, more particularly, to a method for determining if an Internet domain name has been registered in a specific domain.

### B. Description of the Related Art

Internet domain names are related to Internet Protocol (IP) numerical addresses. Every "host" that is linked directly to the Internet (e.g., computers) must be identified by a specific IP numerical address. Data transmission over the Internet is in fact accomplished by directing the data to such numerical addresses. An IP address includes four numbers separated by periods. Currently, each number must be between 0 and 255.

Numerical addresses, however, are difficult for humans to remember. Consequently, a domain name may be used as part of what amounts to a type of mnemonic for that IP address. For example, the domain name infoway.com, forms part of ns.infoway.com, which is an easier-to-remember mnemonic for the host located at IP address 207.90.216.53. In this way, the mnemonic is at least roughly analogous to the letters that are sometimes used to signify a specific telephone number, e.g., 1-800-FLOWERS is a mnemonic for 1-800-356-9377.

The availability of Internet domain names (e.g., "ibm.com," "microsoft.com," "netscape.com," etc.) is now a significant business issue, because a domain name is the identifier by which an individual, a company, a governmental entity, an educational institution, etc. (referred to collectively as simply "companies") can be found on the Internet.

As is well known in the art, minor variations in a name can be registered with the InterNIC as domain names. The InterNIC, is a registration service for registering domain names located at Network Solutions, Inc., Herndon, Va. For example, it has been reported that the domain names 1-800-DENTIST.COM and 1800DENTISTCOM are owned by two different entities.

In addition, companies, that have, or aspire to have, an international Internet presence must keep in mind the domain name scheme in other countries. For example, it has been reported that "apple.com" and "apple.co.uk" are owned by different companies, as are "apple.net" and "apple.org."

Domain names are specific to a domain, which is a geographic area defined at a global-level or at a country-level. A global-level domain covers all countries worldwide. Examples of global-level domains include .com, .edu, .gov, and .org. A country-level domain covers only a given country. Examples of country-level domains include .us for the United States and .fr for France. Additionally, country-level domains may contain an indication of a sub-domain within the domain. When a sub-domain is specified for a domain name, the domain name is recognized only in that sub-domain and not the domain that it is a part of.

The term "domain name system" (DNS) refers to a distributed database that is responsible for translating the

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Internet names into numerical addresses (e.g., 207.90.216.53), routing mail to its proper destination and many other services. The DNS comprises DNS servers or other machines that runs software permitting it to query a database (hosted either locally or on another machine) referred to as a DNS database. The DNS database contains records associating particular domain names with specific Internet Protocol (IP) numerical addresses (e.g., 207.90.216.53).

A user that wishes to check the availability of a domain name in, for example, five different countries will typically submit a separate Whois query, or its equivalent, to the domain-name registration authority in each country. Whois queries provide a way of finding registering organization names, e-mail addresses, administrative technical and billing contacts, postal addresses, and telephone numbers, of those who have registered domain names. Whois is available for use from "http://rs.internic.org," and available for download at "http://www.shareware.com." The queries might be automated to the extent that the countries in question support automated electronic queries (e.g., via a Web browser form), but in other countries the queries must be initiated by some other means, e.g., FAX, mail, email, phone call, etc. In either case, to perform a query for registered domain names in multiple countries, a user would have to submit a separate search request to each domain, thus making the searching process very time-consuming and cumbersome. It is therefore desirable to improve systems that search for domain names.

## SUMMARY OF THE INVENTION

Methods, systems, and articles of manufacture consistent with the present invention provide an improved query server that overcomes the shortcomings of existing domain name searching techniques by performing a multitude of searches simultaneously, transparent to the user. Specifically, the improved query server searches for an existing domain name records in various domains and then displays the results in a formatted manner, thus eliminating the need for a user to perform individual searches.

In accordance with methods consistent with the present invention, a method is provided in a data processing system with DNS servers, each responsible for maintaining registration records of domain names for an associated domain. This method receives user input containing a domain name and specified ones of the domains, transmits a request for a search of the domain names to the DNS servers associated with the specified domains, receives search results from the DNS servers associated with the specified domains, and displays the search results. The search results indicate, for each of the specified domains, whether a domain name record exists in the specified domain.

## BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate an implementation of the invention and, together with the description, serve to explain the advantages and principles of the invention. In the drawings,

FIG. 1 depicts a data processing system suitable for practicing methods and systems consistent with the present invention;

FIG. 2 depicts a more detailed diagram of the query server depicted in FIG. 1;

FIG. 3 depicts a more detailed diagram of one of the DNS servers depicted in FIG. 1;

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FIG. 4 depicts a flow chart of the steps performed by the query engine of FIG. 1 when searching for registered domain names in accordance with methods and systems consistent with the present invention;

FIGS. 5a-5b depict a user interface in accordance with methods and systems consistent with the present invention; and

FIGS. 6a-6c depict example display outputs in accordance with methods and systems consistent with the present invention.

### DETAILED DESCRIPTION

The following detailed description of the invention refers to the accompanying drawings. Although, the description includes exemplary implementations, other implementations are possible, and changes may be made to the implementations described without departing from the spirit and scope of the invention. The following is a detailed description of the invention. The following is a detailed description of the invention does not limit the invention. Instead, the scope of the invention is defined by the appended claims. Wherever possible, the same reference numbers will be used throughout the drawings and the following description to refer to the same or like parts.

#### Introduction

In accordance with methods and systems consistent with the present invention, a query server is provided that receives a query from a user of a client computer using a client program such as Netscape Navigator or Microsoft Internet Explorer. The query server receives the query from the client computer either directly or, alternatively, via one or more intermediary computers such as one operated by an Internet access provider, an on-line service, etc. Although the client program may generate a query at one computer, the results of the query may be returned by the query server to another computer. The format of the query can take any of a number of forms (e.g., with switches in a command line or check boxes in a graphical user interface).

The query results in the generation of a response indicating, for example, that a specified Internet host name (e.g., apple) has been registered in a specified domain (e.g., the sub-domain .co within the country-level domain .uk), resulting in a domain name (e.g., apple.co.uk).

#### System Components

FIG. 1 depicts a data processing system 100 suitable for practicing methods and systems consistent with the present invention. Data processing system 100 includes a client computer 106, a query server 104, and a number of DNS servers 108 interconnected via network 102. The client computer 106 is used by the user to submit queries to query server 104. Query server 104 receives the queries from the client computer 106 and performs these queries on DNS servers 108. Query server 104 may also contain Hyper Text Markup Language (HTML) code for transfer to a browser on the client computer 106. DNS servers 108 contain a domain name database that associates DNS records with domain names. A DNS record contains a domain name and the associated numerical address. DNS records may also contain textual information regarding the domain name. For example, a DNS record may indicate a contact person for a particular domain name. DNS servers 108 receive query requests from the query server 104 and search the domain name database for a DNS record associated with the domain name. Although only one client computer 106 is depicted, one skilled in the art will appreciate that data processing system 100 may contain many more client computers.

FIG. 2 depicts a more detailed diagram of query server 104. Query server 104 contains a memory 220, a secondary

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storage device 230, a central processing unit ("CPU") 240, an input device 250, and a video display 260. Memory 220 includes domain name query engine 222 that interacts with client computer 106 and DNS servers 108. Query engine 222 includes query software 224 that submits search requests to various DNS servers 108 located throughout the network. One example of the query software may be a UNIX utility tool called "nslookup" available on most UNIX platforms. Alternatively, query software 226 may be a script to interact with various Domain Name Servers. Query engine 222 also includes search engine 226 that uses a forking system to perform domain name queries in parallel. The forking system initiates multiple sub-processes to perform a subset of the queries once the query process has begun. The forking system reduces the total time to complete a search since multiple sub-processes will perform the queries in parallel. Query engine 222 further includes HTML parser 228 that parses HTML form parameters passed to and from the client browser when a search is submitted to the search engine 226. Search engine 226, query software 224 and HTML parser 228 are preferably written in the PERL environment available for download from Internet sites, such as "http://www.perl.com."

Secondary storage device 230 includes a domain file 232 that includes a listing of the available domains used by the search engine to create the queries. Also included in domain file 232 is a domain extension suffix to append to the domain name to create a full domain name to be searched. For example, the domain extension suffix ".co.uk" when combined with the domain name "apple" will create the full domain name "apple.co.uk." Domain file 232 may also contain the numerical address of a DNS server for each domain and whether the domain supports a Whois query. Moreover, domain file 232 may also optionally include other fields for specialized searches, such as Gross Domestic Product (GDP) or whether the domain is a member of European Union or a Western country. These specialized fields allow the user to create a specialized domain name search in various environments. For example, a user may select to search for a domain name located in a top 50 GDP country. One skilled in the art will appreciate that other specialized fields may exist, including Asian countries or even high Internet usage countries.

FIG. 3 depicts in greater detail an exemplary DNS server 108. DNS server 108 contains a memory 320, a secondary storage device 330, a central processing unit ("CPU") 340, an input device 350, and a video display 360. Secondary storage device 330 includes DNS server database 332 containing resource records that describe all the registered domain names within its zone. A "zone" contains the domain names and data that a domain contains, except for domain names and data that are delegated to a sub-domain. For example, the domain "ca" (for Canada) may have the sub-domains "ab.ca" (Alberta), "on.ca" (Ontario), and "qb.ca" (Quebec). Authority for the "ab.ca," "on.ca," and "qb.ca" domains may be delegated to the DNS servers in each of the provinces. The domain "ca" contains all the data in "ca" plus all the data in "ab.ca," "on.ca," and "qb.ca." However, the zone "ca" contains only the data in "ca." In other words, the domain name "apple.ca" is listed in the "ca" DNS server database, while the domain name "apple.qb.ca" is listed in the "qb.ca" DNS database. Memory 320 includes program 322 that receives search requests from query server 104 for searching and retrieving information about the domain name from DNS database 332. One example of program 322 may be Berkeley Internet Name Domain (BIND) implementation of DNS available for download from the Internet Software Consortium at "http://www.isc.org."



Although aspects of the present invention are described as being stored in memory, one skilled in the art will appreciate that these aspects may be stored on or read from other computer-readable media, such as secondary storage devices, like hard disks, floppy disks and CD-ROM; a carrier wave received from a network like the Internet; or other forms of ROM or RAM. Additionally, although specific components and programs of query server 104 and DNS server 108 have been described, one skilled in the art will appreciate that a query server or a DNS server suitable for use with methods and systems consistent with the present invention may contain additional or different components.

#### Domain Name Searching Process

Further details on operation of the search process will now be explained with reference to the flow chart of FIG. 4. The domain name search process is initiated, for example, by a request from client computer 106 to perform a search for a domain name (step 402). For example, client computer 106 may send an HTML request to query engine 104 using the well known Hypertext Transfer Protocol. Once the request is received, query engine 222 interrogates domain file 232 (step 404) and transmits all possible domains to search and the accompanying specialized fields in an HTML format to display on client computer 106 (step 406). That is, query engine 222 transmits a possible domain to search "uk" with an identification that the domain is part of the European Union and also from a top 50 GDP country.

Once displayed, a user using client computer 106 enters a domain name to search, for example "apple," and a type of search to be performed, for example "top 50 GDP countries" (step 408). A user may request a search for registered domain names in all domains, as shown in FIG. 5a. Alternatively, the user may request a specialized search. That is, a search for a registered domain name in a set of domains based on the accompanying specialized fields. For example, a user may request to search in only the top 50 countries ranked by annual GDP, as depicted in FIG. 5b. One skilled in the art will appreciate that other combinations of domain selections exists, for example Western countries, Asian countries or a customized search, in that the user at client computer 106 may select a subset of domains to search from the total number of domains.

Upon the user at client computer 106 entering a domain name to search, client computer 106 sends the user input to query server 104 (step 410). Once received at query server 104, HTML parser 228 parses a listing of domains and a domain name to search submitted by the client computer 106 (step 412). Query engine 222 then invokes search engine 226 to spawn a number of search sub-processes (step 414). In this step, search engine 226 calculates the number of search sub-processes to spawn based on the number of domains to query submitted by client computer 106 so that each search sub-process contains at most 11 domains to search. Essentially, search engine 226 forks the queries into multiple sub-processes to perform the domain name searches in parallel for optimized performance. Each spawned search sub-process is given a subset of domains to query, thus query server 104 may perform multiple queries at once. For example, if client browser 106 selects 50 domains to query, search engine 226 may spawn 5 search sub-processes, so that each spawned search sub-process queries 10 DNS servers. Further, depending on the load of query server 104, search engine 226 may change the number of search sub-processes to spawn.

Once the search processes are spawned, a separate section of query engine 222, query software 224, transmits, to a DNS server for the domain in question (e.g., a DNS server

108 for .qb.ca or for .com), a request for a search of a domain-name database for a DNS record associated with the domain name (step 416). The transmission of the search request could be direct, but more likely will be relayed through one or more intermediary machines. For example, a search request generated by a query server in Houston could be transmitted to London; then to Moscow, and then to Zimbabwe, where the target DNS server 108 might be located.

In response to the search request, the DNS server 108 searches its domain-name database for a DNS record associated with the specified domain name (step 418). The DNS server 108 generates a response that indicates whether a DNS record was found for that domain name.

Query server 104 ultimately receives the response from DNS server 108 (step 420) and keeps a record of all responses from the DNS servers 108 until all responses have been received. If a response indicates that the domain-name database contains a DNS record associated with the domain name, query engine 222 flags that response signifying that the domain name has indeed been registered in the specified domain for further inquiry. This response is referred to as an "unavailability response." The unavailability response provides the user, with at least some indication (although not necessarily a conclusive one) that the domain name might not be available to be adopted in the domain in question.

Once all of the DNS servers 108 have responded with information about domain-name unavailability, query engine 222 performs a subsequent query for all registered domain names that support a Whois query (step 424). Using Whois, query software 226 can also learn additional information about a domain name. Query engine 222 invokes query software 226 to perform a Whois query in the domains that returned an unavailable response for a particular domain name. Domain file 232 contains a listing of domains supporting the Whois queries, since not all domains support Whois functionality.

Finally, in step 424, the results from the initial query and/or supplemental Whois query are presented to the user in a suitable display format. In either case, query engine 222 collects, sorts and formats the results for display to client computer 106. The results may be displayed in an HTML format.

FIGS. 6a and 6b depict the results displayed to the user. FIG. 6a depicts an HTML display presented to the user using client computer 106 for search results 602. In this particular search, the user requested a domain name specialized search in all Asian and Pacific countries for the domain name "Mercedes." Items 604 indicate domains for which the domain name is currently unavailable, while items 606 indicate domains for which the domain name is available. If desired, a user may request to register a domain name as indicated by item 606 by selecting item 610. That is, item 610 links a user to an HTML order form, as shown in FIG. 6c, for the specified domain. The order form dynamically creates an order request for a particular domain name in the specified domain. The user supplies information, such as credit card and contact information, and once all the information is entered, the user may submit the order form to the appropriate registering service by email or by the well known hypertext transport protocol in order to begin the registration process. Also, Item 608 indicates that the domain ".com.au" supports the Whois functionality and contains further details on the administration for the domain name "Mercedes." By selecting item 608, a user will view the supplemental, Whois queries for all domains supporting Whois functionality, as shown in FIG. 6b.

Also if desired, the query server can develop and maintain a centralized data store of "taken" domain names indicating which domain names have been registered and in which domain(s) they are registered. In response to a user's query, the query server can then search the centralized data store to make a quick, first-pass determination whether the domain name of interest has been "taken."

#### Conclusion

Methods and systems consistent with the present invention search for registered domain names in a plurality of domains by transmitting a request to search a domain-name database to selected domains. One of the advantages to searching domains in this manner is that the query server can send search requests to many top-level Domain Name Servers (e.g., uk, fr, de, and so on) so that the searches can be performed quickly and, from the user's perspective, essentially simultaneously. This searching capability is available to any Web enabled client browser, UNIX or many other operating systems. For example, a domain name search may be implemented by a command line instruction. Methods consistent with the present invention also work well with multi-processor machines. On a multi-processor machine, a search may show up on more than one processor thread. Finally, systems consistent with the present invention can work well with domain name search engines written in C++, Perl, C or even Java programming languages.

The foregoing description of an implementation of the invention has been presented for purposes of illustration and description. It is not exhaustive and does not limit the invention to the precise form disclosed. Modifications and variations are possible in light of the above teachings or may be acquired from practicing of the invention. For example, the described implementation includes software but the present invention may be implemented as a combination of hardware and software or in hardware alone.

#### What is claimed is:

1. A method in a data processing system with DNS servers, each responsible for maintaining registration records of domain names for an associated domain, comprising:

receiving user input containing a domain name, a plurality of domains and at least one search criterion corresponding to the plurality of domains;

transmitting a request for a search of the domain name to each of the DNS servers associated with the plurality of domains;

receiving search results from each of the DNS servers associated with the plurality of domains indicating, for each of the specified domains, whether a domain name record exists for the domain name in the specified domain; and

displaying the search results.

2. The method of claim 1, wherein the results are sorted and formatted in a hypertext markup language.

3. The method of claim 1, wherein the transmitting step further includes:

determining a number of search processes to spawn based on a number of specified domains; and

spawning the number of the search processes, wherein each search process queries at least one of the DNS servers.

4. The method of claim 1, wherein the receiving user input step includes:

reading a domain file to determine available domains; and displaying the available domains to a user to enable the user to indicate the specified domains.

5. The method of claim 1, wherein the receiving user input step includes:

displaying a predetermined number of domains based on the at least one search criterion; and

indicating at least one of the predetermined number of domains as the specified domains.

6. The method of claim 1, further comprising:

determining whether the domain name record exists for the domain name for each specified domain; and

performing a query to obtain registration information for the domain name when the domain name record exists.

7. The method of claim 1, further comprising:

displaying an order form for registering the domain name in a specified domain.

8. A method in a data processing system with DNS servers, each responsible for maintaining registration records of domain names and other specialized fields for an associated domain, comprising:

receiving user input containing a domain name, a plurality of domains, and at least one search criterion corresponding to the plurality of domains;

transmitting a first request to a first DNS server to determine whether a domain name record exists in the domain associated with the first DNS server, said first request comprising said domain name and a first domain;

simultaneously transmitting a second request to a second DNS server to determine whether a domain name record exists in the domain associated with the second DNS server, said second request comprising said domain name and a second domain;

receiving search results from the first request and the second request indicating whether the domain name record exists in the domain associated with the first DNS server and indicating

whether the domain name record exists in the domain associated with the second DNS server; and

displaying the search results to a user.

9. A data processing system comprising:

a plurality of DNS servers, each DNS server configured to maintain registration records of domain names and other specialized fields for an associated domain; and

a query server containing:

a memory with a program configured to:

receive user input containing a domain name, a plurality of domains, and at least one search criterion corresponding to the plurality of domains;

transmit a request for a search of the domain name to each of the DNS servers associated with the plurality of domains; and

receive search results from each of the DNS servers associated with the plurality of domains indicating, for each of the specified domains, whether a domain name record exists in the specified domain;

a display configured to display the search results; and a processor configured to run the program.

10. The data processing system of claim 9, wherein the program sorts and formats the search results in a hypertext markup language.

11. The data processing system of claim 9, wherein program contains a spawn component configured to determine a number of search processes to spawn based on a number of specified domains, and configured to spawn the

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number of the search processes, wherein each search process queries at least one of the DNS servers.

12. The data processing system of claim 9, wherein the program contains a component configured to:

display a predetermined number domains based on the at least one search criterion, and

receive an indication of at least one of the predetermined number of domains as the specified domains.

13. The system of claim 9, wherein the program contains a registration component configured to:

examine the search results to determine whether a domain name record exists for each of the specified domains, and configured to perform a query on each DNS server to obtain registration information for the domain name when the domain name record exists.

14. The system of claim 9, wherein the program contains an order component configured to:

create an order form for registering the domain name in a specified domain.

15. A computer-readable medium containing instructions, for controlling a data processing system to perform a method, the data processing system having DNS servers, each responsible for maintaining registration records of domain names and other specialized fields for an associated domain, the method comprising:

receiving user input containing a domain name, a plurality of domains, and at least one search criterion corresponding to the plurality of domains;

transmitting a request for a search of the domain name to each of the DNS servers associated with the plurality of domains;

receiving search results from each of the DNS servers associated with the plurality of domains indicating, for each of the specified domains, whether a domain name record exists in the specified domain; and

displaying the search results.

16. A method in a data processing system with DNS servers, each responsible for maintaining registration records of domain names for an associated domain, comprising:

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receiving user input containing a domain name and specified ones of the domains, wherein the domains have an associated country with a gross domestic product;

displaying a predetermined number of domains based on the gross domestic product of the associated countries; indicating at least one of the predetermined number of domains as the specified domains;

transmitting a request for a search of the domain name to the DNS servers associated with the specified domains;

receiving search results from the DNS servers associated with the specified domains indicating, for each of the specified domains, whether a domain name record exists for the domain name in the specified domain; and

displaying the search results.

17. A data processing system comprising:

a plurality of DNS servers, each DNS server configured to maintain registration information of domain names for an associated domain wherein each domain has an associated country with a gross domestic product;

a query server containing:

a memory with a program configured to

receive user input containing a domain name and specified ones of the domains;

transmit a request for a search of the domain name to the DNS servers associated with the specified domains,

receive search results from the DNS servers associated with the specified domains indicating, for each of the specified domains, whether a domain name record exists in the specified domain;

display a predetermined number of domains based on the gross domestic product of the associated countries, and

receive an indication of at least one of the predetermined number of domains as the specified domains;

a display configured to display the search results; and

a processor configured to run the program.

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